

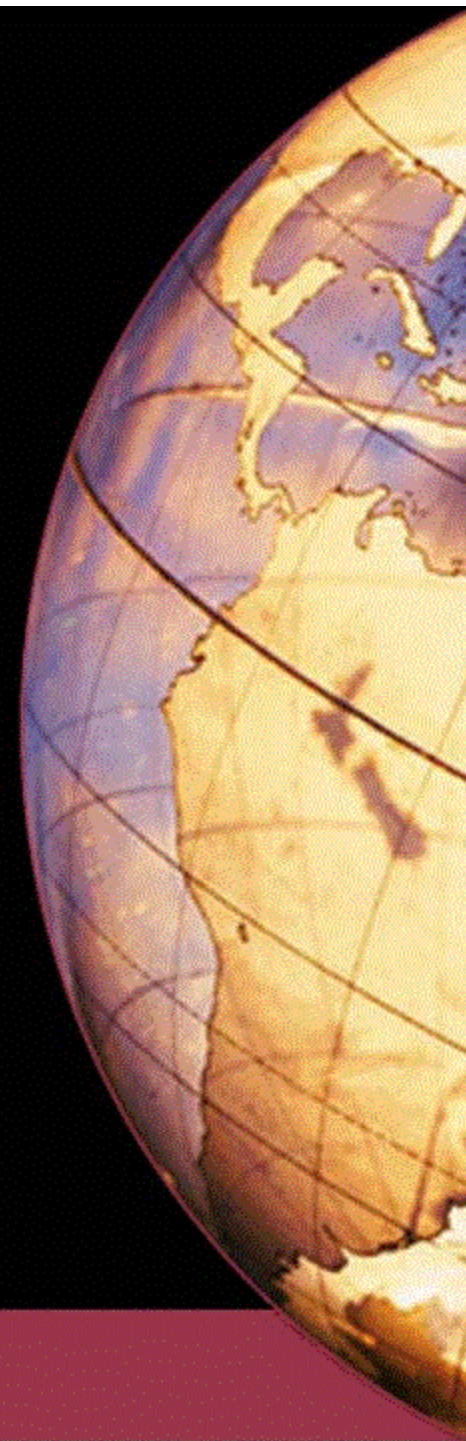
Using VHF Data Link for Security Applications

Integrated CNS Technologies
Conference and Workshop

April 30, 2002

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NASA-GRC Objective

Demonstrate a concept that can be implemented and deployed in the next two years to:

1. Downlink audio and video from the cabin and cockpit
2. Downlink Flight Recorder data and archive on the ground



Operational Concept

- Downlink initiated by aircraft crew member, sky marshal, or ground controller in response to:
 - On-board security incident
 - In-flight emergency
- Use Dedicated Emergency VHF Data Channel.
- Downlink info displayed at ATC station, Security station, Airline Operations Center (AOC), and/or Maintenance station.
- Once initiated, parameters may be modified by command from the ground to control audio, video, or FDR source.

Communications Infrastructure

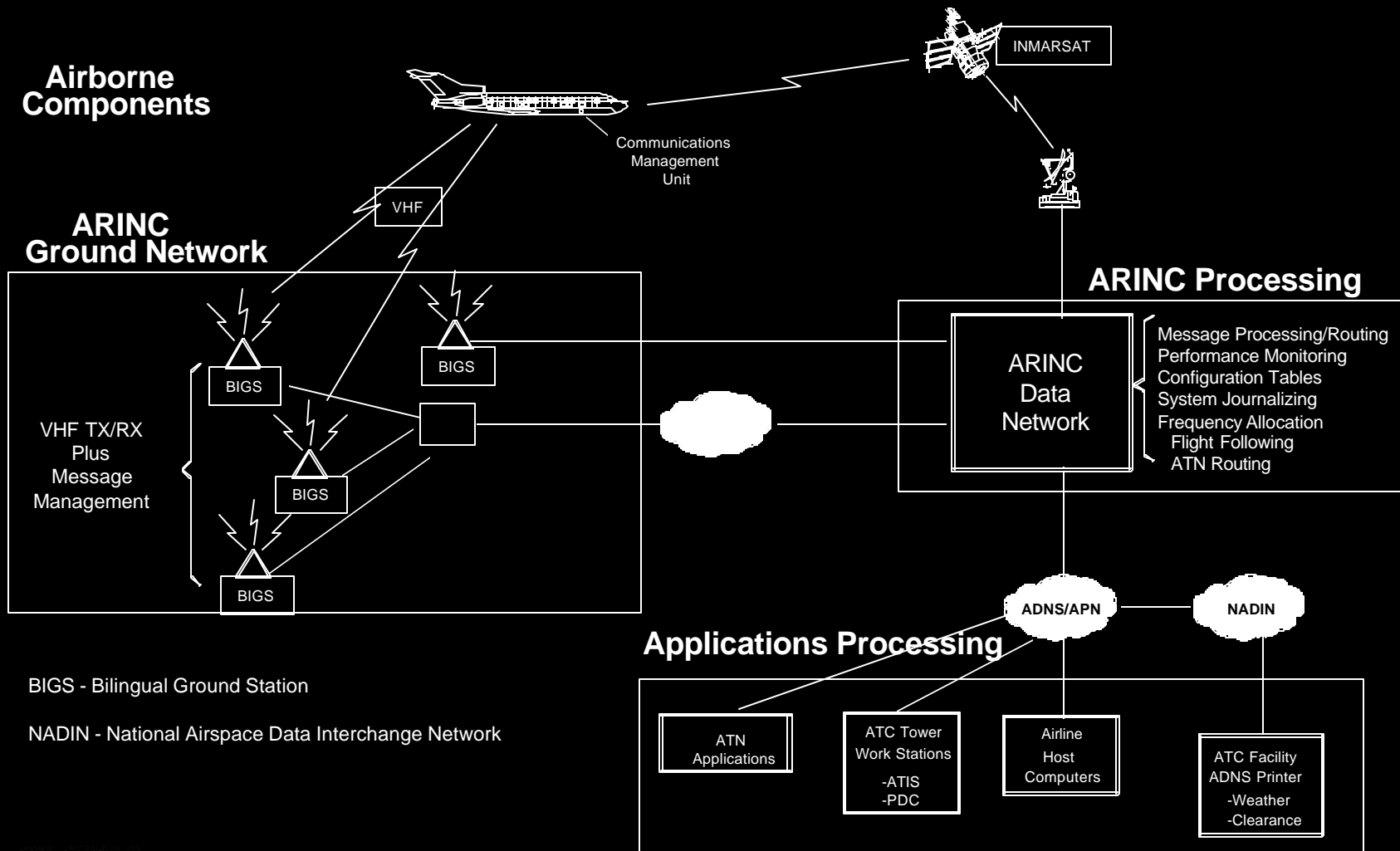
- ARINC Globalink VHF service provides ACARS air-to-ground data link communications services to 6000 aircraft worldwide.
 - 300 ground stations in North America provide continuous coverage above 18,000 feet.
 - Narrow bandwidth limits data that can be sent.
- VHF Digital Link Mode 2 (VDL Mode 2) enables the introduction of graphic weather products and file transfer services and is the enabling technology for the FAA's CPDLC program.
 - Greater bandwidth allows transmission of more information.
 - Network deployment is in progress.

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Data Link System Operation



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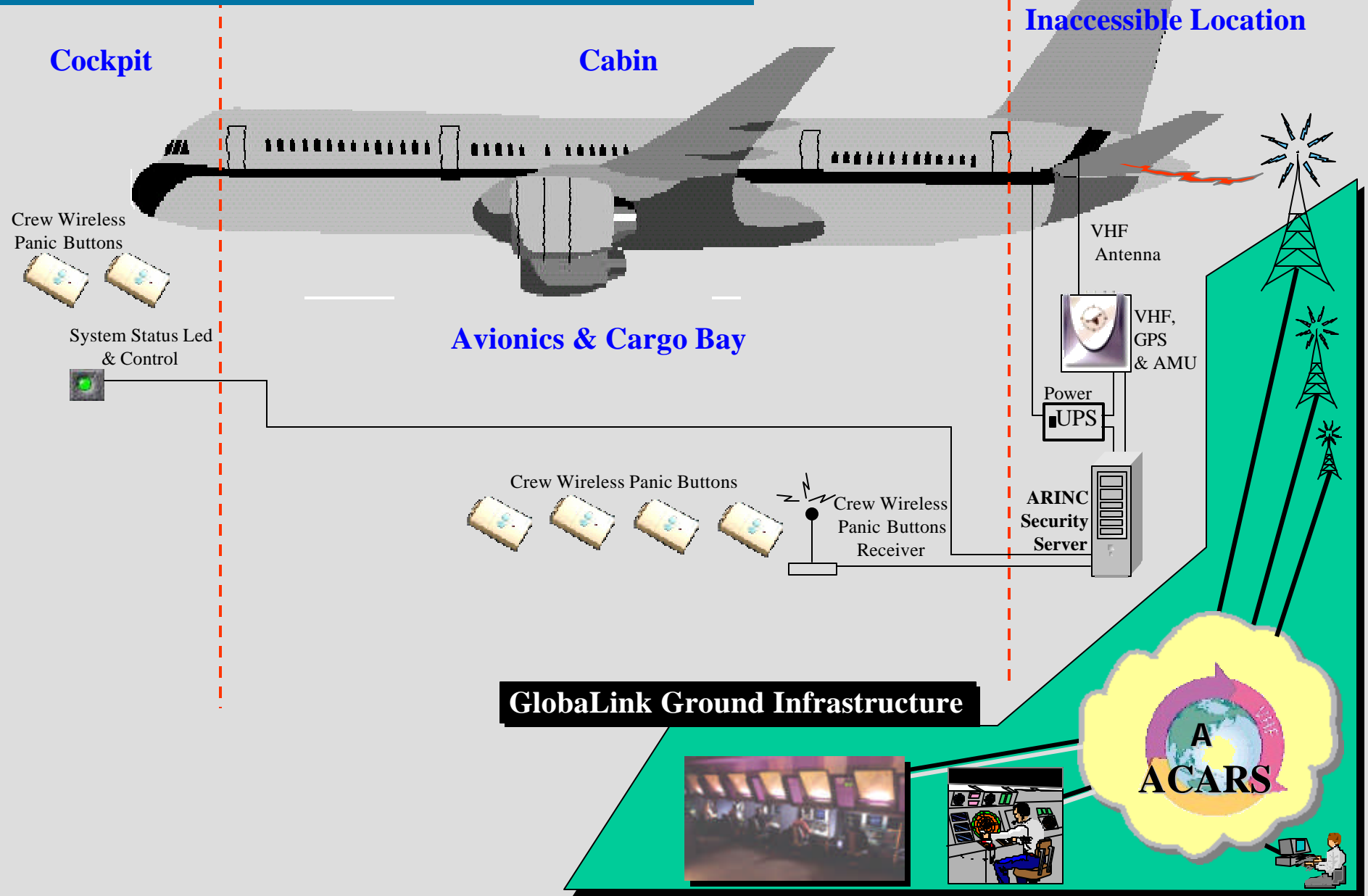
Aircraft System Concept - Basic System

- Basic System - Uses ACARS Network
 - Independent and isolated FlyTimer transceiver (with GPS) that is immune to airborne tampering.
 - Upon activation, autonomously transmits emergency message to ground using existing ARINC network.
 - Ground display alerts operator to problem and reports a/c position.
 - Once activated, system can be turned off only by ground command.
 - Suitable for use on virtually any aircraft; not just ACARS equipped.



Autonomous On-Board Security Systems Demonstration

"Panic Button"



Aircraft System Concept - Enhanced System

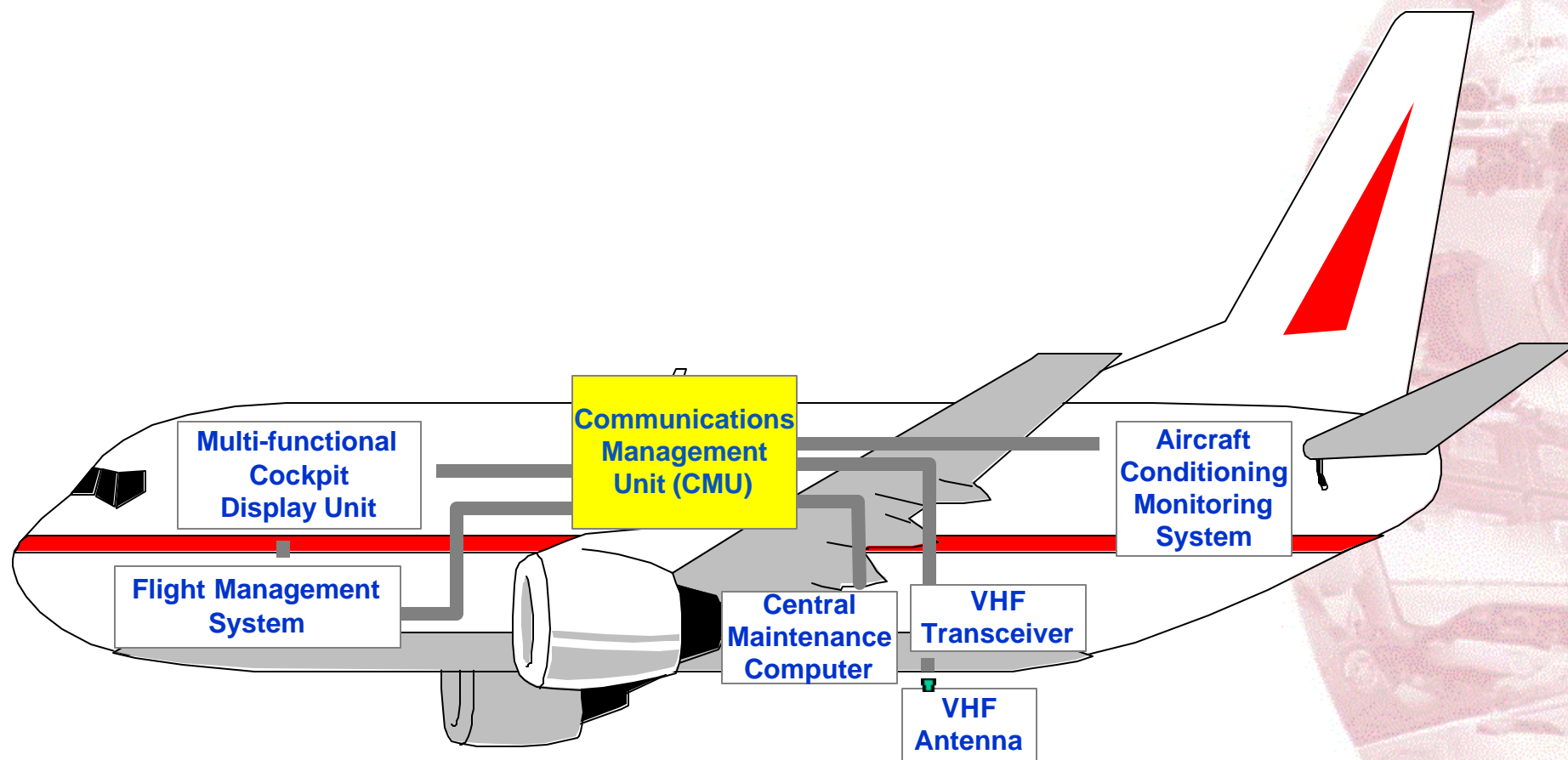
- Enhanced System - Uses VDL Mode 2 Network
 - Video camera, microphone, and Flight Data Recorder integrated with aircraft communications system.
 - Data transferred over dedicated channel at approximately 12 Kbps to ARINC ground network.
 - Continuous transmission of audio.
 - Video image updated every minute.
 - FDR data transmitted continuously.
 - Suitable for installation on a/c equipped with VDL Mode 2 data link.

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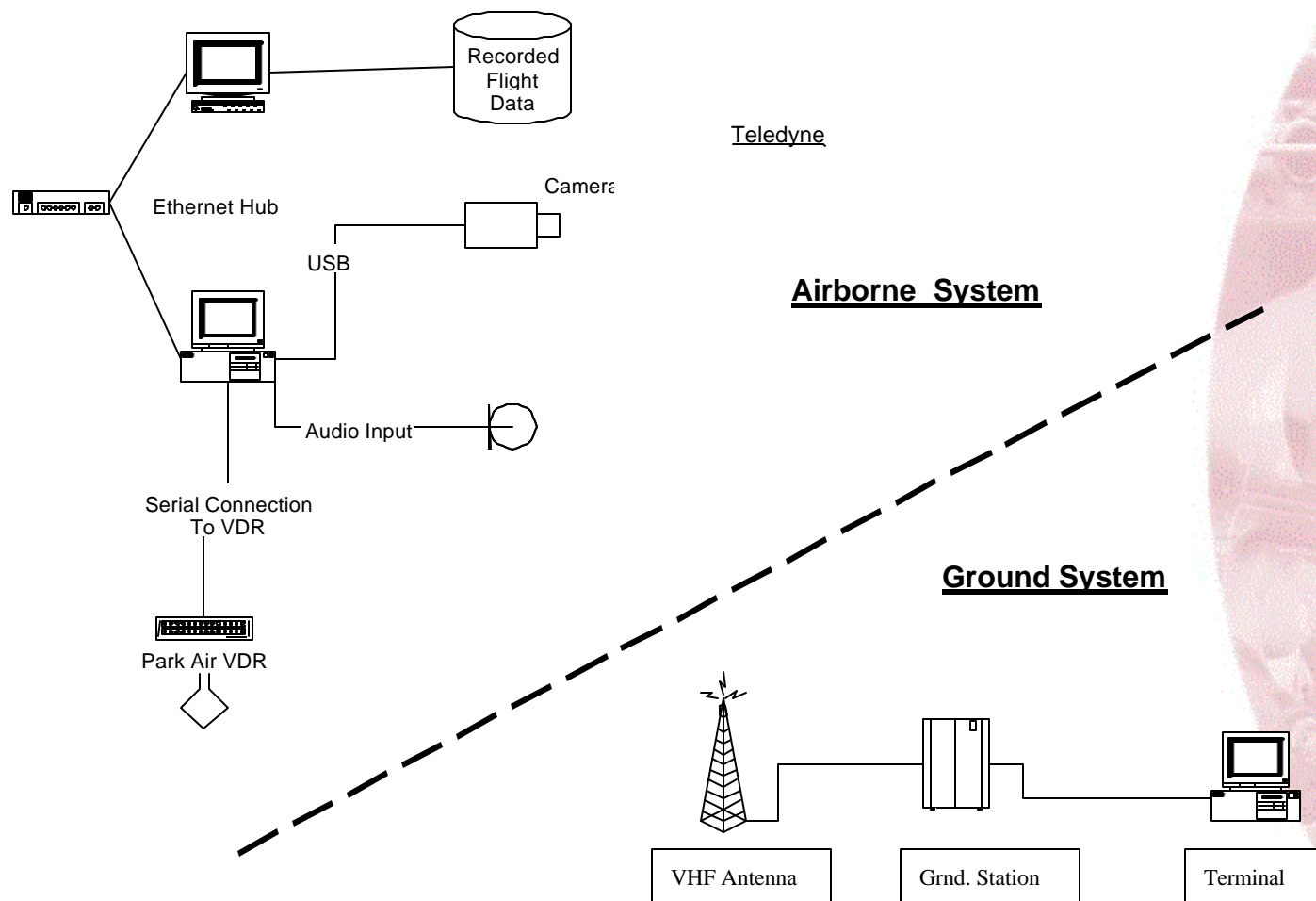
VDL Mode 2 Aircraft



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VDL Mode 2 Demonstration System



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Evolution / Capabilities

ACARS

- Interface to panic button
- Position, Speed & Direction
- Ground based flight following
- Ground based messaging
- Plain text messages
- Cockpit display potential

VDLM2

- Audio & Video download
- FDR downlink
- Interface to panic button
- Position, Speed & Direction
- Ground based flight following
- Ground based messaging
- Plain text messages
- Cockpit display potential

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Teledyne Controls Parameter Display

Profile: 0000 - Temporary Profile

Parameter	Units	Value
GMT	HH:MM:SS	03:20:36
AIR / GROUND		AIR
ALL GEAR DOWN/LOCK		
PRESSURE ALTITUDE	FEET	864
RADIO ALTITUDE	FEET	804
ALTITUDE RATE	FT/MIN	2976
PRESENT POS. LATITUDE	DEG	22.58
PRESENT POS. LONGITUDE	DEGREES	120.35
MAGNETIC HEADING	DEG	098
TRUE HEADING	DEG	098
DRIFT ANGLE	DEG	1.1
GROUND SPEED	KNOTS	169
COMPUTED AIRSPEED	KNOTS	164.0
WIND DIRECTION	DEG	336
WIND SPEED	KNOTS	7.0
N1 ACTUAL LEFT	% RPM	87.6
N1 ACTUAL RIGHT	% RPM	86.4
N2 ACTUAL LEFT	% RPM	94.8
N2 ACTUAL RIGHT	% RPM	94.6
AILERON POS. LEFT	DEG	-0.3
AILERON POS. RIGHT	DEG	5.1
RUDDER POSITION	DEG	1.1
ELEVATOR POS. LEFT	DEG	1.41
ELEVATOR POS. RIGHT	DEG	0.70
FUEL FLOW LEFT	PPH	12672
FUEL FLOW RIGHT	PPH	12032
GROSS WEIGHT	LBS	0
PITCH ATTITUDE	DEG	16.00
ROLL ATTITUDE	DEG	16.87
SEAT BELT SIGN		OFF
STATIC AIR TEMP	DEGREE C	27.3
TOTAL AIR TEMP	DEGREE C	31.00
L.E. SLATS EXTENDED		----
L.E. SLATS PART EXT		PART EXT
L.E. SLATS RETRACTED		NOT RETRAC
LDG GEAR LEVER		UP
T/R DEPLOYED RIGHT		STOWED
T/R DEPLOYED LEFT		STOWED

NASA Security: ARINC VDLMS - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Frame 1



Frame 6



Frame 2



Frame 7



Frame 3



Frame 8



Frame 4



Frame 9



Frame 5



Frame 10



Implementation Plan

- Develop System Requirements with stakeholders
- Develop Operational Procedures
- Petition for Emergency VHF Channel for Data Link
- Deploy Basic System using ACARS Network as a near-term implementation
 - Develop Specifications
 - Refine ground applications and deploy ground terminals
- Deploy Enhanced System using VDL Mode 2 Network
 - Develop airborne system - Avionics, FDR, sensors
 - Upgrade ground control systems for new applications